

Abstracts for oral presentations

Session 1:

Practice makes even more perfect: young adults improve and retain gains in the performance of in a common everyday activity

Gil Leizerowitz & Avi Karni

Most of the paradigms used to study the process of skill mastering address simple tasks or single simple aspects of tasks, in strict laboratory settings. However, the neuro-behavioral time-course of complex skill learning and specifically, procedural memory consolidation, in activities which are relevant to daily life, remain unexplored. Here, we followed the effects of repeated execution (practice) of a complex task - the Timed-up-and-go (TUG) task that serves as a clinical test of the ability to execute motor activities relevant to daily function, rising from a seated position, walking, turning and returning to a seated position - as a possible learning experience in healthy adults who presumably perform at their best in everyday conditions. To this end, young healthy adults (N=15) performed 18 consecutive trials of the TUG in one session, eight trials on the following day and 20 more trials after a week. The participants were video recorded and wore inertial measurement units (Mobility Lab, APDM) in order to measure TUG trial parameters and execution time. The results showed that repeated experience is a driver of performance improvements (learning) and of the generation of long-term memory even in highly experienced individuals performing common everyday tasks. Moreover, there is evidence for an ongoing improvement in TUG performance between one session and the next. The results indicate that procedural knowledge acquisition, by young adults, proceeds in complex everyday tasks as it does in simple laboratory task settings; task repetition (practice) can make wonders even in an 'overtrained' activity of daily living.

Changes in Effective Connectivity Following Aphasia Treatment for post-stroke patients

Tammar Truzman & Tali Bitan

Background: In recent years, many studies focused on the role of the right hemisphere in language rehabilitation after left hemisphere stroke. Studying brain activity and connectivity changes is crucial to our understanding of the language mechanisms involved in rehabilitation and has important theoretical and clinical implications. **Method:** Four participants with aphasia following left hemisphere stroke underwent phonological language treatment. Two fMRI scans were administered pre- and post-treatment and included phonological and semantic tasks and a perceptual control task. In addition, eight healthy controls were scanned with similar tasks and similar time gaps, without language intervention. **Analysis:** Dynamic Causal Modelling (DCM) was used to examine effective connectivity among three right hemisphere regions: dorsal IFG (rdIFG), ventral IFG (rvIFG), and lateral temporal cortex (rLTC). The analysis was conducted separately in the phonological and semantic tasks, and all possible connections were included in the model. We identified connections that were modulated by the language task and asked which modulatory effects changed from pre- to post-treatment in participants with aphasia but not in healthy controls. **Results:** In the phonological task, the bidirectional rdIFG ↔ rLTC connection strengthened and the rLTC→rvIFG connection was weakened in patients from pre- to post treatment. In the semantic task, the rLTC→rvIFG connection strengthened in patients after treatment. **Discussion:** Previous studies show that dorsal and ventral left IFG are involved in phonological and semantic lexical processing, respectively. Nevertheless, these differences are not evident in the right hemisphere. Our finding suggests that during treatment there is an increase in the differentiation between sub-parts of rIFG, that matches the function in corresponding left hemisphere regions. These changes can underlie adaptive or maladaptive plasticity.

A novel taste state of mind

Nathaniel Gould & Kobi Rosenblum

Formation of long term memory for newly learned tastes is crucial for adaptive behavior and survival. Quinone reductase 2 (QR2) removal from the anterior insular cortex (aIC) is a pivotal element in this process, centrally mediating the cholinergic effect following novel stimuli via redox modulation. However, it is unknown within which cell type in the aIC removal of QR2 occurs, nor how this affects neuronal function. Here, we show QR2 is predominantly expressed and suppressed within SST interneurons across the mouse aIC following novel taste consumption. Interestingly, both novel taste and QR2 inhibition reduce excitability, specifically within SST interneurons. Furthermore, reducing QR2 expression in SST, but not in PV or excitatory neurons, is sufficient to enhance novel taste memory. This therefore points to QR2 mediated intrinsic property changes of SST interneurons in the aIC as a central removable factor to allow novel taste memory consolidation.

A Gene x Environment model of schizophrenia-like social and cognitive deficits in glutamate dehydrogenase-deficient mice

Kfir Asraf & Inna Gaisler-Salomon

Aims: Glutamate dehydrogenase 1 (GDH) plays a central role in the metabolism of glutamate. GDH, coded by the *Glud1* gene, regulates glutamate levels presynaptically. A previous study we conducted in CNS-only full knockout mice revealed elevated hippocampal glutamate along with deficits in a wide range of cognitive and social behaviors resembling key aspects of schizophrenia psychopathology. **Methods:** we investigated the effects of mild stress on social and cognitive behavior in CNS-*Glud1*^{-/+} mice. CNS-*Glud1*^{+/-} mice and their CNS-*Cre*⁺ controls underwent a mild stress paradigm consisting of 3 i.p. injections of saline over a 24-hour period in early adulthood (PND 70). Separate groups of stress-naïve CNS-*Glud1*^{+/-} and CNS-*Cre*⁺ mice were used as controls. A week later, mice were tested in a battery of behavioral tests which included the Open Field, Social Preference and Recognition, and Spatial Discrimination and Reversal in the Water T Maze. Two weeks later brains were extracted, and mRNA expression in mPFC was examined via RNA-seq analysis. miRNA expression in mPFC was examined via RT-PCR. **Results:** Stress-exposed CNS-*Glud1*^{+/-} mice showed novelty-induced hypo-locomotion in the first 5 minutes of the Open field task, and impaired spatial learning and reversal in the Water T Maze task. Furthermore, altered expression of E/I balance-related genes, as well as miRNAs, were found. **Conclusions:** Our findings indicate that CNS-*Glud1*^{+/-} mice exposed to stress in early adulthood are a unique model of gene x environment interactions particularly relevant to the negative and cognitive symptoms of schizophrenia.

Activation of Rac1 GTPase in basolateral amygdala leads to long-term fear memory impairment and neuronal morphological changes

Joana Freitas Costa & Raphael Lamprecht

Evidence indicates that long-term memory-related processes such as its consolidation, extinction, and forgetting involve changes in synaptic efficacy produced by alterations in neuronal transmission and morphology. Rac1 GTPase activity is regulated by synaptic activation and it can affect neuronal morphology by controlling actin-regulatory proteins. In this study, we have analyzed the role of Rac1 GTPase in the regulation of neuronal morphology and memory formation using a photoactivatable form of Rac1 (PA-Rac1). PA-Rac1 was expressed in the basolateral amygdala (BLA) and activated during fear conditioning. Two days afterward the brains were removed and subjected to the ScaleS clearing method in order to observe possible changes in neuronal morphology. We revealed that activation of PA-Rac1 during fear conditioning impaired long-term memory (as shown previously, Das et al., 2017). In addition, we were able to observe significant changes in neuronal morphology in PA-Rac1 activated neurons in the BLA two days after fear conditioning. We detected a reduction in the volume and length of the dendritic shaft and an increase in spine density in specific dendritic branches. These findings suggest that such alterations in neuronal morphology are involved in attenuating fear memory formation in the BLA.

Session 2:

Do High Autistic Traits Influence Herding Ability in Human Groups?

Marton-Alper, I.Z., Gvirts Provolovski, H. Z., Nevat, M., Karklinsky, M. & Simone Shamay-Tsoory,

Herding is ubiquitous throughout all social life forms, providing beneficial outcomes. In the current study, we examine whether herding emerges spontaneously in human groups and whether it adheres to the core principles of herding observed in the animal kingdom. Using a computerized paradigm involving the movements of circles, we tested the emergence of spontaneous and intentional herding of 136 participants assigned into groups of four participants. Herding was assessed by measuring directional synchrony in the movements of the circles, level of cohesion, and separation between circles. We found that human groups tend to spontaneously herd, particularly in terms of directional synchrony, supporting the notion of a human herding instinct. We further asked whether individuals with high traits of Autism Spectrum Disorder (ASD) exhibit differences in their herding tendencies. Results indicated that individuals with high ASD traits showed greater social separation from the group, compared to individuals with low ASD traits. Moreover, we found diminished spontaneous synchrony, but intact instructed synchrony in the high vs. the low ASD traits group. We contend that humans spontaneously herd with their group and suggest that the spontaneous tendency to synchronize with others is diminished in individuals with high ASD traits, though it is recovered when synchronization is intentional. We discuss the implications and potential interventions.

Developmental Differences in Contextual Fear and Avoidance Learning

Zohar Klein & Tomer Shechner

Abstract Body: Generalized fear and avoidance describe the processes whereby defensive behaviors extend from a previously learned danger cue onto novel stimuli. Most of the research examining fear generalization has focused on specific stimuli characteristics, however the context in which fear learning occurs is commonly overlooked. Notably, the overgeneralization of fear across contexts is a core symptom of anxiety. This study examined how a safe compared to a dangerous context affects fear and avoidance generalization among youth and adults. Forty adults and forty adolescents completed a differential fear conditioning paradigm whereby each conditioned stimulus appeared with a background context. In the dangerous context, a threatening cue predicted an aversive sound and a safety cue was never paired with the aversive sound. In the safe context, the aversive sound was never administered. Next, participants underwent a fear generalization test in which 3 generalized stimuli (GSs), ranging on a perceptual continuum between the threatening and the safety cue, were presented in both contexts. Participants then completed an avoidance conditioning phase, allowing them to actively avoid upcoming events by pressing a button. Finally, in the avoidance generalization test, GSs reappeared while the avoidance button was available again. Eye-tracking, physiological indices, behavioral avoidance and self-reported fear were collected. Preliminary results show that adults showed greater discrimination between stimuli and contexts during learning and generalization compared to youth. These developmental differences is likely driven by adolescent's elevated fear responses toward safety and ambiguous signals (i.e., CSM and GSs) resulted in poor distinction among youth.

GABA-related microRNAs in stress vulnerability and stress resilience

Maayan Krispil-Alon & Gal Richter-Levin

Objectives: Despite high lifetime prevalence of traumatic events, only a minority of people develop post-traumatic stress disorder (PTSD). Childhood adversities as well as being a female are major factors contributing to vulnerability. The expression of miRNA-33 and miRNA-144, which target clusters of GABA related proteins, was shown to be upregulated upon stress exposure. However, it is unclear whether observed phenomena is associated with PTSD vulnerability or resilience. Moreover, it has not yet been studied in the context of juvenile stress and sex differences. The aims of the current study were: 1. To determine whether the exposure to juvenile stress correlates with alterations of miRNA-33 levels and miRNA-144 in sub-regions of the hippocampus. 2. To compare miRNA-33 and miRNA-144 expression levels between vulnerable and resilient individuals. 3. To investigate the sex effect on expression of miRNA-33 and miRNA-144. **Method:** The study employed the exposure to juvenile stress followed by an exposure to underwater-trauma in adulthood. A 'Behavioral Profiling' was used to differentiate between vulnerable and resilient subjects. **Results:** In male rats, studied miRNAs showed differential pattern of expression depending on hippocampal region. miRNA-144 was upregulated in the dorsal dentate gyrus (DG) of the resilient animals, whereas miRNA-33 was upregulated in the ventral DG. In contrast, in females the levels of miRNA-33 and miRNA-144 consistently increased only in vulnerable animals in the ventral CA1. **Conclusions:** Upregulation of miRNA-33 and miRNA-144 might be a part of trauma resilience mechanisms in males but of trauma vulnerability in females.

Elevating anandamide signaling reverse the effects of early stress on depression-like behaviors and microRNAs expression in adulthood

Anna Portugalov & Irit Akirav

Background: Early life adverse experiences significantly increase predisposition to psychopathologies, including depression. The endocannabinoid system (ECB) has been suggested as a therapeutic target for the treatment of stress-related disorders. Here we examined whether administrating at late-adolescence the fatty acid amide hydrolase (FAAH) inhibitor URB597, that elevates brain anandamide levels, can ameliorate depressive-like behavior and alter the expression of microRNAs (miRNAs) in the prefrontal cortex (PFC). miRNAs are a type of small non-coding RNAs, suggested to be crucially involved in depression **Methods:** Male and female rats were exposed to early life stress (ELS), the "neglectful mother" paradigm, from postnatal day (P)7 to P14. During P45 to P60 (late-adolescence) URB597 (0.4 mg/kg), was administered i.p. for 2 weeks. On P90 (adulthood) rats were tested for depression-like behavior and microRNA's expression. **Results:** Males and females demonstrated at adulthood depression-like behavior, such as decreased social behavior and increased immobility in the forced swim test. In the medial PFC, ELS males and females demonstrated a decrease in miR-135a and ELS males demonstrated a decrease in miR-16. Importantly, URB597 normalized depression-like behavior in both sexes as well as miR-16 expression in the mPFC of ELS male rats. Furthermore, ELS-mediated decrease in the expression of miR-16 was correlated with reduced social behavior. **Conclusions:** Our findings show for the first time that enhancing ECB signaling can prevent ELS-induced decrease in PFC miRNAs and associated depression-like behavior. This may advance our knowledge on pathways dysfunctional in depression in cortical areas and suggest a mechanism for the beneficial effects of ECB enhancers.

Using computational tools to distinguish Li-responders and non-responders among BD patients

Utkarsh Tripathi & Shani Stern

Bipolar disorder (BD) is a chronic mental disorder that results in unordinary and sometimes rapid fluctuations in mind-frame, vitality, focus, and capacity to do everyday tasks. The mood stabilizer Lithium has been a generic option for medical treatment over the years. However, more than half of BD patients (~70%) do not respond to treatment. Efforts are essential to distinguish the potential Lithium responders from non-responders at an earlier stage of the disease. We have used the Induced Pluripotent stem cell technique to derive neurons from lymphoblasts obtained from patients. To classify these neurons, we used extensive whole-cell patch-clamp recordings. We trained a Naïve Bayes classifier (NBC) with the electrophysiological characteristics of patients whose responses to Li are known and performed extensive functional analysis of these recordings. For patients with unknown Li-response, the trained NBC enables accurate classification with a more than 92 percent success rate. We developed information theory analyses of the above electrophysiology recordings to observe the differences with the non-responders. We have found notable differences in entropies of cell measures and mutual information among pairs of cell measures between control, Li-responders (LR), and Non-Li-responders (NR). We have continued to analyze the electrophysiological recordings from VPA-treated BD patients, which can be another possible drug for treating BD. We observed a significant difference in various cell parameter values in the context of LR and NR after VPA treatment. Our analyses give positive implications that Information theory can aid with our understanding of cellular changes in BD pathology.

Session 3:

Exploring inequity aversion in the archerfish

Orit Nafcha & Shai Gabay & Simone Shamay-Tsoory

The current study was designed to examine whether archerfish present inequity aversion (IA). We chose the archerfish to be our model since we could exploit their natural ability to shoot down insects by training them to shoot at targets presented on computer screens. We explored whether the fish deliberately preferred choosing targets rewarding both itself and its passive tank-mate (1/1) over targets rewarding only itself (1/0) (advantageous IA). In a follow up experiment we examined whether this preference changed when the tank-mate received more food than the agent fish (1/2) (disadvantageous IA). We found that when the outcomes for both fish were equal the fish favored the more social targets, those that resulted in food delivered for both fish. But when the passive fish received more food than the active fish this pattern was reversed such that the active fish chose more frequently the self-advantage outcome. Interestingly, in a control experiment, when there was no fish on the other side of the partition, there was no preference in the acting fish's selections. The findings from this study strengthen the claim that the cortex is not essential for demonstrating behavioral aversion to unfair distribution of rewards. Moreover, the tendency of the fish to choose the stimuli providing food for a neighboring fish indicates that, in a context that allows it, even the competitive archerfish exhibit prosocial tendencies, tendencies that remain as long as no advantage is given to the other fish.

Neural correlates of social interaction in mice

alok nath mohapatra & Shlomo Wagner

Social interactions involve multiple sensory modalities and shape instantaneously by dynamic, mutual feedback between the participants. With the complexity of social interactions, there are unique "social" brain regions and circuits that commit to the sensorimotor transformation of social information. Studies highlighting a few of these regions that encode specific social interactions illustrate respective circuits; which interface within themselves in the form of a bigger network. Could distinct principles govern social information processing on a mesoscopic scale? To address this, we used multi-electrode arrays to record local field potentials (LFP) from several regions simultaneously, from adult male mice while they interacted with a novel same-sex conspecific. We observed that the power of Theta and Gamma oscillations increased in presence of social stimulus compared to before the introduction of stimuli. Further, Central amygdala (CeA) and paraventricular nucleus of the hypothalamus (PVN) showed enhanced coherence in theta oscillations during this period. Moreover, specific brain regions in the amygdala, striatum and hypothalamus showed significantly higher gamma oscillations when the mice initiated an interaction with social stimuli. In conclusion, though there is a brain-wide higher theta activity after the introduction of stimuli, which may be attributed to general heightened arousal in the male mice; differential neural dynamics can be observed in specific brain regions. Further, we report specific brain regions that respond specifically to initiation of interactions with social stimuli, indicating a specific role in social interaction.

Suspenseful music enhances incidental long-term declarative memory

Nawras Kurzom & Avi Mendelsohn

Successful formation and retention of long-term declarative memory is influenced, among other things, by attention, emotion, and deviation from expectations. We examined the effect that musical features, and particularly musical suspense/tension, exert on the formation of declarative memory. This was tested by composing three original music pieces that contained both suspenseful and neutral musical conditions. A galvanic skin response (GSR) study was first conducted on 19 participants in order to validate the musical attributes of the composed excerpts. Indeed, suspenseful musical excerpts, characterized by prolonged delays in melodic resolution, were associated with heightened GSR, corroborated by increased subjective ratings of suspense as compared to neutral excerpts. These musical stimuli were subsequently used in experiments that tested the influence of suspenseful music on long-term memory. In the encoding stage, 44 participants listened to the three musical pieces while they were presented with unique images that were evenly dispersed among four condition – suspense, suspense-resolution, neutral music, and silence. One day later, their memory performance was examined using a memory-recognition test for images presented during encoding and for new pictures. We found that memory performance was enhanced for pictures presented during the suspenseful musical periods compared to the other conditions, and particularly for participants who did not report felt tension during the suspenseful excerpts. Understanding the interrelations between musical components, which exert powerful and fundamental responses in humans, and cognitive faculties as proposed, is bound to provide insights as to the basic features of memory formation and retention.

Attitudes toward online social interactions and technology in relation to offering help in COVID-19 pandemic

Gabriela Gorska & Aviva Berkovich-Ohana

As the COVID-19 pandemic locked millions of people at home, technology proved to be an indispensable tool allowing to sustain many aspects of everyday life, including social behaviors. Complying with quarantine measures, people were not able to provide help or support each other in usual manner. At the same time, the need to receive help also grew due to difficult circumstances. Our study explored whether technology enables or disables this specific type of social interaction - helping one another. We discovered that the General Online Social Interaction Propensity (GOSIP), as well as the Vulnerability subscale of the Technology Adoption Propensity index (TAP), are valid predictors of proneness to offer help online. Interestingly, TAP Vulnerability was also a significant predictor of offline helping behaviors. We suggest that those who create helping opportunities online should take under consideration various personality predispositions in order to maximize the outcome.

Session 4:

Is neuroticism really bad for you? Dynamics in personality and limbic reactivity prior to, during and following real-life combat stress

Noa Magal & Roei Admon

Background: Neuroticism has been linked to stress vulnerability, potentially via its association with elevated limbic reactivity. Stress exposure, on the other hand, has been shown to impact neuroticism scores. Whether stress-induced dynamics in neuroticism are associated with changes in limbic reactivity, and whether these patterns depict vulnerability or resilience response, has yet to be directly assessed. **Methods:** In order to address these critical gaps, we conducted a prospective multi-modal longitudinal assessment of personality, stress-related psychopathological symptoms, and neural function and structure, in fifty healthy young adults recently drafted to military service.

Three assessment points were completed over the course of four and a half years, accounting for prior to, during, and long-time following military service that included active combat. **Results:** Despite exposure to multiple potentiality traumatic events, participants maintained low levels of posttraumatic and depressive symptoms. Personality changes over time included elevation in neuroticism from prior to during stress, and a subsequent reduction in neuroticism following stress offset. Elevated neuroticism during stress was associated with reduced amygdala and hippocampus reactivity to stress related content and this pattern was reversed following stress offset. A similar pattern was found for hippocampus-midcingulate cortex (MCC) connectivity and MCC grey matter thickness.

Conclusions: Exposure to prolonged real-life stress during early adulthood may induce personality changes that are mediated by changes in limbic reactivity and connectivity patterns as well as by structural changes. Considering that participants maintained high functioning and overall health during and following severe real-life stress, these dynamics may depict behavioral and neural mechanisms that facilitate stress resilience.

Identifying variables that predict depression following the general lockdown during the COVID-19 pandemic

Einav Gozansky, Gal Moscona & Hadas Okon-Singer

Background: This longitudinal study aimed to define psychological markers for future development of depression symptoms following the lockdown caused by the COVID-19 outbreak. We focused on loneliness, intolerance of uncertainty, economic stress and emotion evaluation biases as potential predictors of elevated depression levels. This study was conducted at two time points, during and after a general lockdown in Israel, enabling examination of immediate as well as short-term influences of the lockdown on subjective well-being. **Methods:** During the general lockdown in April 2020, 553 participants reported their psychological health by means of online questionnaires along with a unique emotion interpretation bias task. Of these participants, 129 took part in a second phase in June 2020. The data was analyzed using structural equation modelling that enabled detailed investigation of the relationships between sociodemographic and individual traits. **Results:** Subjective loneliness, rather than objective isolation, was found as a strong predictor for symptoms of depression five weeks later ($\beta = .2, p = .009$), when controlling for depression levels during the lockdown ($\beta = .48, p < .001$). Younger age ($\beta = -.22, p = .002$) and health stress ($\beta = .19, p = .004$) also predicted higher non-clinical levels of depression and emotional distress. **Discussion:** Considering the global rise in mental health problems due to the COVID-19 outbreak, our results shed light on some of the predictive factors that contribute to the development of depression symptoms. As the global crisis continues, focusing on psychological factors is important for the efforts of identifying individuals at risk of developing depression, and for promoting new prevention strategies.

Does reading written spoken Arabic words compare to reading literary Arabic low frequency words? An event-related potential analysis

Samer Andria & Asaid Khateb

Diglossia in Arabic refers to the existence of two varieties of the same language: Spoken Arabic (SA) and Literary Arabic (LA). Previous studies have suggested that written SA words were processed as low frequency LA words. Objective: This study aimed at assessing word frequency effects in LA and at characterizing the electrophysiological correlates (ERPs) of the processing of SA and LA words. LA high frequency words (LA-HF), LA low frequency words (LA-LF) and SA high frequency words (SA-HF) were used together with their equivalent pseudowords during a lexical decision task. Results: Behaviorally, the fastest RTs were observed for LA-HF followed by SA-HF and then by LA-LF. Electrophysiologically, the results showed first a modulation of the P100 component: the highest amplitude for LA-LF followed by SA-HF then by LA-HF with no differences between the first two. This suggested that the first two conditions behaved similarly, and that less familiar written representations elicited larger brain responses. A modulation of the orthographic N170 component was also observed, being larger for LA-HF than for LA-LF and SA-HF. Furthermore, the P6 component, which is related to late memory/decision making processes, was of higher amplitude in LA-HF than for LA-LF and SA-HF. Conclusions: These observations indicate that processing of SA written words compares to the processing of LA-LF words. This finding is discussed in the context of the diglossia question and supports the view that LA and SA words are part of the same linguistic system, although their processing might mimic that of first and second language.

Alterations of hippocampal oxytocin trigger spatial memory and synaptic plasticity impairments induced by acute high-fat diet intake in juvenile rats

Tala Khazen, Guillaume Ferreira & Mouna Maroun

The neural circuits that regulate emotion and cognition undergo maturation during juvenility and thus are vulnerable to environmental and metabolic challenges. Since juvenility is a critical developmental stage characterized by major changes in the hippocampus and vulnerability to food, we recently addressed whether short exposure to high-fat-diet(HFD) in juveniles would affect hippocampal dependent functions. We found that 7-days exposure to HFD in juvenile rats(21PND) impaired hippocampal plasticity (in vivo long-term-potential, LTP) and hippocampal-dependent spatial-memory (Khazen et al.,2019). In the present study,we therefore evaluated the interaction between oxytocin(OXT)- a hormone that plays a critical role in the control of energy homeostasis and its levels have a positive correlation with body weight and body fat,and HFD in juveniles. Importantly,we addressed whether these factors can modulate hippocampal LTP and spatial memory in juvenile rats. We found that short-term juvenile HFD decreased OXT levels in the CA1. Interestingly, systemic OXT injections rescued HFD-induced LTP impairment in CA1.Moreover, deficits in spatial-memory induced by juvenile HFD were prevented by either systemic OXT injection or intra-CA1 infusion of OXT receptor-agonist.Finally,we found that blocking OXT-receptors in CA1 impaired spatial-memory in control-fed juveniles, suggesting that OXT plays a role in spatial-memory in the CA1. These results show for the first time that OXT in the CA1 is critical for spatial-memory in juveniles and that short-term HFD reduces OXT levels in the hippocampus that eventually lead to CA1 plasticity and spatial memory deficits.These effects of HFD may explain the increasing prevalence of cognitive disorders in overweight children and highlight therapeutic potential of OXT.

Abstracts for blitz session

Pre-reproductive stress in adolescent female rats alters oocyte microRNA expression and offspring phenotypes: pharmacological interventions and putative mechanisms

Hiba Zaidan, Dalia Galiani & Inna Gaisler-Salomon

Pre-reproductive stress (PRS) to adolescent female rats alters anxiogenic behavior in first (F1)- and second-generation (F2) offspring and increases mRNA expression of corticotropin releasing factor receptor type 1 (Crhr1) in oocytes and in neonate offspring brain. Here, we ask whether the expression of Crhr1 and Crhr1-targeting microRNA is altered in brain, blood and oocytes of exposed females and in the brain of their neonate and adult F1 and F2 offspring. In addition, we inquire whether maternal post-stress drug treatment reverses PRS-induced abnormalities in offspring. We find that PRS induces a selective increase in Crhr1-targeting mir-34a and mir-34c in blood and oocytes, while non-Crhr1 microRNA molecules remain unaltered. PRS induces similar microRNA changes in prefrontal cortex of F1 and F2 neonates. In adult animals, cortical Crhr1, but not mir-34, expression is affected by both maternal and direct stress exposure. Post-PRS fluoxetine (FLX) treatment increases pup mortality, and both FLX and the Crhr1 antagonist NBI 27914 reverse some of the effects of PRS but also have independent effects on F1 behavior and gene expression. PRS also alters behavior as well as gene and miRNA expression patterns in paternally-derived F2 offspring, producing effects that are different from those previously found in maternally-derived F2 offspring. These findings extend current knowledge on inter- and trans-generational transfer of stress effects, point to microRNA changes in stress-exposed oocytes as a potential mechanism, and highlight the consequences of post-stress pharmacological interventions in adolescence.

Vicarious Fear Learning across Development: Nuances in Observational Fear Acquisition and Extinction among Children, Adolescents, and Adults

Yael Skversky-Blocq & Tomer Shechner

Observational fear learning is a robust model explaining fear acquisition and extinction yet fear learning research has devoted little attention to it especially across development. The first study compared observational fear acquisition across youth and adults. Thirty-six children, 41 adolescents, and 40 adults underwent observational fear acquisition followed by a direct exposure test. Skin conductance response (SCR) and self-reported fear were measured. Results showed successful observational fear learning in all age groups as indexed by SCR, yet developmental differences emerged: children showed overall higher physiological arousal during acquisition compared to adolescents and adults. Additionally, children reported less differential fear and were less successful at reporting the CS-US contingency. Finally, adolescents tended to overgeneralize their fear compared to adults. The second study explored direct versus observational extinction following observational fear acquisition. Eighty-one adults and 93 adolescents underwent observational fear acquisition followed by one of three extinction conditions: (1) observational, (2) direct, (3) no extinction. Finally, all participants underwent a direct exposure test. SCR, self-reported fear, and eye-tracking were measured. Adult results showed successful fear acquisition but no SCR differences between the conditions during fear extinction. Interestingly, an interaction was found in the differential self-reported danger/safety rating during the direct exposure test: the no-extinction group reported significantly more differential fear compared to the observational but not the direct extinction group. Taken together, these studies are the first to take a cross-sectional approach to understanding observational fear learning. Both studies revealed developmental differences that have theoretical and clinical implications for exposure therapy.

Will work for effect: How response-contingent perceptual effects reinforce behavior

Rivka Aviv & Oded Klavir

Research focusing on judgements of one's control over one's actions and events in the environment has demonstrated that it can be a predictor of life achievements and health, while its disruptions represents a core characteristic of many psychiatric disorders. Successfully manipulating one's environment has previously been argued to be inherently rewarding, assumingly affecting performance by influencing patterns of response selection. Studies in humans have shown that information about the effectiveness of a response, even when it merely indicates that the response led to a perceptual change (e.g., a brief 'flash'), reinforces the response that is credited with this, value-neutral, effect (i.e., effectiveness-feedback). On the one hand, the motivating effect of being effective could be a higher order phenomena relying on a higher cognitive mechanisms, yet on the other this could be a basic mechanism perfecting and shaping even the simplest responses. In order to test this question, In this study, we tested the effectiveness-feedback in mice using a newly designed behavioral task. Based on previous work in humans, which established that only immediate response-effects were reinforcing we predicted that effectiveness-feedback, in the form of light appearing immediately after a lever press, will reinforce the mice's behavior to press the relevant lever more than a delayed appearance of light (delayed effectiveness-feedback). The behavioral experiment provides substantial support that this is indeed the case, implying that the (motivating) effects on behavior are driven by environmental information about one's own effectiveness. The presence of such an effect in mice indicates for the first time, that as in humans, other animals are also intrinsically motivated by an effectiveness-feedback with striking resemblance to the parameters that determine 'effects' in humans. This suggests that effectiveness is a basic mechanism in shaping behavior.

Experimental Evidence for Subcortical Involvement in Mental Rotation

Gily Mozes & Shai Gabay

It has been argued that when participants take part in mental rotation tasks, they recruit visuospatial perceptual circuits primarily located in cortical areas. We designed a noninvasive behavioral experiment (using the stereoscope method) to examine whether such an account applies to mental rotation processes. By presenting two rotated images (0°, 50°, 100° or 150°, identical or mirrored) to one eye (monocular) or segregated between the eyes (interocular), we were able to explore the contribution of monocular portions to the mental rotation. We found a monocular involvement (mainly subcortical), indicated by better performance when the identical objects were presented in a high angular disparity (100°, 150°) to a single eye compared to the interocular presentation. Furthermore, the results indicate that the processes involved in the perception of mirrored and identical objects already operate at the monocular channels' level. We argue that the cortical assumption cannot explain the monocular benefit observed in our results. The monocular benefit suggests that mental rotation processes require some of the cortico-subcortical loops that support visuospatial perception and the processes that transform them. Our results call for further studies that should examine the contribution of subcortical mechanisms in high cognitive faculties.

Can blood-borne epigenetic markers predict the efficacy of a pharmacological treatment in an animal model of PTSD?

Ishita Sarkar; Gili Ben-David; Ester Briss; Michal Dudai; Gil Atzmon; Gal Richter-Levin

Post-traumatic Stress Disorder (PTSD) is a disabling disorder, which is pharmacologically treated mainly with Selective serotonin reuptake inhibitors (SSRIs) or tricyclic antidepressants (TCAs). The likelihoods of attaining complete remission from these treatments are unpredictable since only 20-30 % of patients respond to the treatment. Moreover, often a patient does not respond to the first subscribed drug, and is put to a long agonizing period of trial and error, until a drug suitable for him is found. Hence, before developing new drugs, the recent times demand developing a more selective approach in screening individuals suitable for specific treatments heralding the age of personalized medicines. In this study we used a rat model of PTSD together with a novel individual behaviour analysis approach, which enabled categorizing each animal as PTSD-affected or unaffected. PTSD-affected animals were treated for one month with either amitriptyline (TCA) or with fluoxetine (SSRI). As with human patients, only about 35% of the affected population responded to the pharmacological treatment, strongly supporting the translational power of the model.

Aiming to develop a predictive biomarker system, blood-epigenetic analysis for selected genes was performed. The results were correlated with the treatment outcome, in order to verify whether epigenetic markers can predict the eventual efficacy of the treatment. Results provided a proof-of-concept, demonstrating that pre-treatment epigenetic markers of selected genes can predict treatment efficacy. These results not only hold potential implications in treatment prediction for PTSD, but can serve as a model to decipher predictive biomarkers for other psychopathologies.

A neuro-behavioral study exploring pain sensitivity in adults with high functioning autism spectrum disorder

Tseela Hoffman & Irit Weissman Fogel

Background: Autism spectrum disorder (ASD) is characterized by an excitatory and inhibitory imbalance in neural brain activity. This may interfere in pain processing resulting in pain hypersensitivity. Aim of Investigations: To examine sensitivity to experimental pain in individuals with high functioning ASD using neurophysiological and psychophysical tools. Methods: Fifty-two adults diagnosed with high functioning ASD and 52 healthy controls underwent pain psychophysical tests evaluating their: (i) pain sensitivity to heat (phasic: 46, 49, 52°C; tonic: warm water bath 46.5°C) and mechanical (pinprick) stimuli, and (ii) ability to modulate pain. Pain ratings were reported using the 0-100 numerical pain scale (NPS). Simultaneous electroencephalography recordings were performed and amplitudes and latencies of the N2 and P2 components of the contact heat evoked potential (CHEPs) were analyzed. Results: ASD individuals reported higher median pain ratings for a variety of suprathreshold heat stimuli e.g. 52°C phasic (ASD 36 vs. control 19, $p=0.0018$) and tonic (ASD 50 vs. control 40, $p=0.0101$). Yet, ASD individuals showed similar responses to mechanical pain stimuli and similar pain modulation magnitudes compared to controls. An interaction was found between the pain ratings of phasic 52°C stimuli and group on the P2 amplitude ($p=0.0032$); the ASD slope of the log transformed data was higher than controls. No group differences were found for CHEPs amplitudes and latencies. Conclusions: Individuals with high-functioning ASD demonstrate hypersensitivity to experimental pain stimuli that unexpectedly is not manifested in neural hyper-responsiveness. Furthermore, differences in pain reports among individuals with ASD are expressed in cortical neuronal activity.

A Novel Deep Neural Network Model to Identify Rodent Ultrasonic Vocalizations

Yizhaq Gousha & Shlomo Wagner

Many measurements can be used to estimate an animal's socio-emotional state such as auditory vocalizations, body position, sniffing regime, and more, each with its strengths and weaknesses. These parameters change according to social and emotional context; vocalizations emitted during mating sessions are different than vocalization emitted during stress and fear, breathing and sniffing rates change when the animal changes mode from normal to investigative. Each of these data types can be used to build a singular modality model that can predict the animals' state to some extent. Yet, neither of them is optimal for capturing a large number of states in a generalized manner.

Here we aim to develop a multimodality deep neural network (DNN) model that combines insights from data collected from numerous sources, which include video tracing, vocalizations both peripheral and individual, respiration rate, brain activity (LFP), and more, and create a multimodality DNN model that can determine and predict the animals' socio-emotional state.

This presentation will be centered on the development and performance of a major part of the model - a novel USV detection model- a robust audio segmentation and classification tool using recurrent (long short-term memory) and convolutional neural networks (LSTM-CNN) aimed to identify and isolate ultrasonic vocalizations (USVs). This model outperformed other methods of syllable detection including benchmark methods such as DeepSqueek and in some cases even manual labeling, performed by experts.

Concept pre-activation improves visual word processing in spoken and literary Arabic: A behavioral and event-related potential study

Bahaa Madi Tarabya & Asaid Khateb

Diglossia in the Arabic language refers to the use of two varieties of the same language (Ferguson, 1959): literary Arabic (LA) and spoken Arabic (SA). Previous studies have suggested that LA words are processed faster than SA words when presented visually. Semantic priming studies have shown that words are processed faster when preceded by a semantically related (SR) prime than by an unrelated (SU) one. This study sought to examine whether the activation of a concept by an image (presented for 100ms) followed immediately either by a related or unrelated SA or LA word (presented for 200ms) will facilitate the processing of SA words. ERP measures were collected in a semantic decision task and the N400 component elicited by LA and SA words was analyzed. Behaviorally, no difference was found SR-LA and SR-SA words ($p=.348$). SU-LA words were processed faster than SU-SA words ($p=.001$). More globally, SR words ($M=702ms$) were processed faster ($p=.001$) than SU words ($M=756ms$). The analysis of the N400 component period showed a significant effect of relatedness ($p=.000$) with SU words inducing a larger N400 amplitude than SR words, but with no effect of language variety. The analysis of the N400 latency from difference waves revealed an earlier peak ($p=.016$) for LA ($M=477ms$) than for SA ($M=503ms$). These results indicate that image priming have improved the visual recognition of both LA and SA semantically related words to the extent that difference in processing between the two varieties disappeared during the image related conditions.

Enhanced endocannabinoid signaling reverses the schizophrenia-like behavioral and gene expression abnormalities induced by chronic adolescence NMDA receptor blockade

Hagar Bauminger, Irit Akirav & Inna Gaisler-Salomon

Background: NMDA receptor blockers are commonly used to mimic aspects of schizophrenia in rodents. Adolescence is a vulnerable time period for symptom development, characterized by dramatic changes in glutamate neurotransmission. The role of the endocannabinoid system (ECS) in the pathophysiology of schizophrenia is unclear. Here, we examined the efficacy of the anandamide hydrolysis inhibitor URB597 in restoring schizophrenia-like phenotypes induced by early-adolescence NMDA receptor blockade by MK-801. **Results:** Early-adolescence MK-801 impaired working memory in the novel object recognition task, diminished social exploration in the social interaction test and altered mRNA expression of glutamate, GABA, cannabinoid receptors and neuroinflammatory markers in medial PFC of adult rats. These behavioral and gene expression abnormalities were absent in rats that received late-adolescence URB597 treatment. **Conclusions:** Early-adolescence MK-801 treatment induced long-term social and working memory deficits that resemble treatment-resistant negative symptoms and cognitive dysfunction in schizophrenia, and altered gene expression patterns in the PFC. The prevention of these abnormalities by late-adolescence URB597 point to the putative therapeutic capacity of endocannabinoid stimulation. Changes in CB2 receptor and the neuroinflammatory marker IL-1b may play a mechanistic role in the interaction between NMDA receptor blockade and the ECS.

Meditation-induced flexibility in networks supporting the embodied-self: A neurophenomenological MEG study

Yoav Schweitzer & Aviva Berkovich-Ohana

The nature of self-experience and its function in health and disease are of great concern to philosophers, psychologists and neuroscientists. A fundamental aspect of self-experience regards the embodied-self, a pre-reflective foundational level of selfhood tied with the sense of agency and body ownership and establishing a self-world distinction. Pilot results showed proficient meditators were able to volitionally induce such embodied-self alterations in the magnetoencephalography (MEG) lab, and that these were marked by decreases in beta-band power over medial and lateral parietal regions. Building on these proof-of-concept studies, we initiated a large-scale neurophenomenological study of the embodied self, combining neural measures (MEG), behavioral tasks and phenomenological interviews. Forty-six long-term meditators received a 3-weeks training enhancing their abilities to volitionally alter their SB, while their brain was scanned in the MEG. We show reduced SB states to be characterized by diminished self-world boundaries and a reduced sense of ownership, agency and first-person perspective. Furthermore, we were able to confirm beta-band reductions to be a neural signature of flexible and reduced SB. The results are interpreted and discussed within a predictive processing framework of self-consciousness, marking reduced top-down priors in regions of multi-sensory integration.

Mechanisms of Action of Mood Stabilizers in Psychiatric Disorders Using Induced Pluripotent Stem Cell Technologies

Ritu Nayak & Shani Shtern

Psychiatric disorders span heterogeneous conditions with variable hereditary and elusive pathophysiology. The use of induced pluripotent stem cells (iPSCs) has revolutionized the opportunities to model psychiatric disorders. In my presentation, I will review the action of lithium and valproic acid (VPA) on iPSC-derived neurons of bipolar disorder (BD) and schizophrenia patients. In BD, patient-derived neurons have been reported to exhibit altered gene expression patterns suggesting their involvement in downstream alteration of various pathways which includes intracellular calcium signaling, phosphatidylinositol signaling, and Wnt/GSK signaling pathways, elevated mitochondrial genes, and hyperexcitability in hippocampal neurons. Interestingly, these abnormalities were differentially reduced by chronic lithium treatment only in the neurons that were derived from lithium responding patients. Recently, VPA studies have also reported rescuing of Wnt/ β -catenin pathway impairment by upregulation of LEF1 expression, acceleration of the transcriptional activity of β -catenin/TCF/LEF1 in lithium non-responsive neurons while a reduction in hyperexcitability was observed in both lithium non-responsive and responsive neurons. Patient-derived neural progenitor cells that expressed lower baseline TRANK1 gene were recovered by chronic therapeutic treatment with VPA. The use of schizophrenia iPSC models to analyze disease pathologies have aided in the investigation of molecular etiologies that includes abnormal differentiation of patient-derived neural stem cells, decreased neuronal connectivity and neurite number, impaired synaptic function, and altered expression of genes in the Wnt signaling pathway. Little studies have been published supporting the findings in cellular and molecular phenotypes of schizophrenia in hiPSCs, and even less has been investigated about the mechanism of action of these mood stabilizers in schizophrenia iPSC models

Behavioral and neural effects of acute methylphenidate administration on choice impulsivity among healthy adults

Maryana Daood & Roe admon & Rachel Tomer

Choice impulsivity is a behavioral pattern characterized by lack of planning and disregard for future consequences, which is reflected in preferential selection of smaller-but-sooner rewards over larger-but-more delayed rewards. This tendency is commonly assessed experimentally by delay discounting (DD) paradigms, which provide choice opportunities between a smaller monetary reward delivered after little or no delay, and a larger monetary reward delivered after a longer delay. There is inconsistency in literature in behavioral studies assessing the impact of acute methylphenidate (MPH) administration, a dopamine indirect agonist, on DD rates, as well as huge variability in results of neuroimaging MRI studies of DD. In order to assess this gap, our study combine multi-modal MRI scanning with pharmacological DA manipulation, employing the pharmacologic fMRI strategy that has been used successfully to reflect the modulatory role of DA in specific brain circuitry. By manipulating DA levels and recording both the behavioral effects and the neural correlates of such neurochemical manipulation, we aimed to provide a better mechanistic explanation for the variability in choice impulsivity among healthy individuals. Fifty-seven young healthy adults were examined, using anatomical, functional and resting state scans and behavioral measures in response to acute MPH administration, in a double-blind placebo-controlled within-subject design. Our preliminary results show that MPH reduces DD rates and that this decrease is mainly due the decrease in smaller delays, in accordance with our hypothesis. Furthermore, we found that MPH administration results in higher activation in the putamen. This is due the high consistency of dopamine transporters there.

Mindfulness for Trauma Recovery in Refugees: Randomized Waitlist-Control Evidence of Efficacy and Safety

Anna Aizik-Reebs & Amit Bernstein

Worldwide, refugees and asylum seekers suffer at high rates from trauma- and stress-related mental health problems. Yet, only a small proportion of this population receives treatment, let alone evidence-based interventions. In particular, there is a need for mental health interventions that are effective, safe, generalize to diverse individuals and populations, yet are also brief, cost-effective, readily implemented, and scalable. We thus developed Mindfulness-Based Trauma Recovery for Refugees (MBTR-R) – a 9-week, mindfulness- and compassion-based, trauma-sensitive and socio-culturally adapted, group intervention for refugees and asylum seekers. To assess whether MBTR-R is efficacious and safe for traumatized asylum seekers, we conducted a randomized waitlist-control trial of MBTR-R among a community sample of 158 Eritrean asylum seekers (46.2% female). Relative to waitlist-controls, intent-to-treat as well as intervention completer analyses indicate that MBTR-R led to significantly reduced rates and symptom severity of PTSD, depression, anxiety and multi-morbidity – at post-intervention and at 5-week follow-up. Second, intervention effects were not dependent on key demographic factors (e.g., gender, education, age), post-migration living difficulties or trauma history severity. Finally, no MBTR-R participant demonstrated lasting clinically significant deterioration in any of the monitored symptoms or well-being. Importantly, MBTR-R appears to be efficacious and safe also for highly traumatized and chronically stressed asylum seekers. Due to its brief intervention format and group-based delivery, MBTR-R may be readily implemented and well-suited for scaling. Considering fast-growing mental health crisis of forced displacement, and extensive barriers to mental health intervention delivery among refugees and asylum seekers, observed MBTR-R efficacy and safety are promising.

The Mirror Effect: Synchrony Reduces Distress in Face-To-Face Interactions

Dovrat Atias & Simone Shamay Tsoory

Although it is increasingly acknowledged that social interactions may provide support at times of adversity, how such interactions can buffer distress remains unclear. Nowadays, the "old fashion interaction" can easily be replaced by a video chat, VR media, or an encounter in social networks. However, these kinds of new interactions may not include some of the main ingredients of non-verbal communication, such as synchrony. Here we suggest that synchronizing with others' distress plays a key role in reducing the distress of others. Recent preliminary findings from a pilot study demonstrate that when aversive emotions of a target are mirrored by an observer (e.g. a matched facial expression and higher motion energy synchrony) their negative intensity is reduced. Building on these promising findings, here we examined the mechanisms underlying the effectiveness of this 'mirror effect' in reducing emotional distress. To this end, we used a dual-functional near-infrared spectroscopy (fNIRS), while participants performed the emotional sharing task (EST) in which a target verbally shares with the observer a real-life distressful emotional event. We hypothesized that behavioral and brain-to-brain coupling would predict emotional distress regulation in the target. Preliminary results show an increase in positive mood following the EST, among the targets. In addition, the targets' first impressions of their regulators, as well as the intra-dyad similarities in first impressions, predicted the motion energy synchrony. Investigating the contribution of synchrony to distress regulation allows us to characterize a brain model of social support which includes the contribution of inter-brain networks to distress regulation.